



1 Complete the table to show the formula and structure type (use ✓s) of the following substances. (10)

Substance	Formula	Monatomic	Simple molecular	Giant covalent	Ionic	Metallic
silver(I) nitrate						
bromine						
potassium bromide						
calcium						
aluminium sulfate						
argon						
ammonia						
ammonium chloride						
hydrogen sulfide						
graphene						

2 a) Explain what the Avogadro constant is.
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..... (1)

b) Calculate the number of molecules of water in 90.0 g of water. (Avogadro constant, $L = 6.022 \times 10^{23} \text{ mol}^{-1}$)
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..... (2)

3 Calculate the relative formula mass (M_r) of the following substances.

a) O_2 (1)

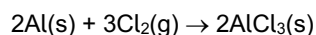
b) K_2SO_4 (1)

c) $\text{Mg}(\text{NO}_3)_2$ (1)

d) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (1)

- 4 Calculate the mass of each of the following.
- a) 5.00 moles of Fe_2O_3 (1)
- b) 0.250 moles of hydrogen (1)
- c) 1.50×10^{-4} moles of aluminium iodide (1)
- 5 Calculate the number of moles of each of the following.
- a) 23.6 g of Cu (1)
- b) 43.8 mg of fluorine (1)
- c) 1.25 tonnes of vanadium(V) oxide (1)
- 6 Convert these quantities into the units shown.
- a) 18 mmol to mol (1)
- b) 20 MPa to Pa (1)
- c) 65 mg to g (1)
- d) 20°C to K (1)
- e) 125 pm to m (1)
- f) 50 cm^3 to dm^3 (1)
- g) 200 cm^3 to m^3 (1)
- 7 250 cm^3 of aqueous solution contains 2.0 g of dissolved sodium hydroxide. Calculate the concentration of the solution in mol dm^{-3}
- (2)
- 8 What mass of oxygen reacts with 2.30 g of sodium? $4\text{Na(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{Na}_2\text{O(s)}$
- (3)

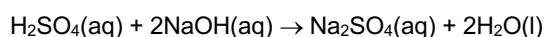
- 9 Which is the limiting reagent and what mass of aluminium chloride is formed when 1.35 g of aluminium is heated with 4.26 g of chlorine?



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(4)

- 10 In a titration, it was found that 25.0 cm³ of 0.150 mol dm⁻³ sulfuric acid reacts with 23.58 cm³ of sodium hydroxide solution. Calculate the concentration of the sodium hydroxide solution in mol dm⁻³.



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(3)

- 11 Write a balanced equation for each of these reactions.

(6)

a) calcium + water

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b) ethanethiol (C₂H₅SH) + oxygen

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c) zinc + hydrochloric acid

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d) potassium carbonate + nitric acid

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e) ammonia + sulfuric acid

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f) copper(II) oxide + nitric acid

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12 Write an ionic equation for each of these reactions. (3)

a) precipitation of iron(III) hydroxide when solutions of sodium hydroxide and iron(III) nitrate are mixed

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b) redox reaction between solution of silver(I) nitrate and magnesium metal

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c) acid-base reaction between sulfuric acid and potassium hydroxide

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13 Complete the table about these atoms and ions. (4)

atom / ion	atomic number	mass number	protons	neutrons	electrons
$^{37}_{17}\text{Cl}$					
$^{37}_{17}\text{Cl}^-$					
			12	14	10
	8	18			10

Area	Strength	To develop	Area	Strength	To develop	Area	Strength	To develop
Done with care and thoroughness			Write formulae (ionic)			Find moles from mass (and vice versa)		
Good SPG			Write formulae (other)			Can do reacting mass calculations		
Shows full working			Write balanced equations			Understands limiting reagents		
Explanations are clear			Write ionic equations			Can do solution calculations		
Convert units			Identify structure type of substances			Can work out PNE numbers in atoms/ions		
Work to appropriate sig figs			Understands Avogadro constant					
Gives units when appropriate			Can work out formula mass					